

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

- A. Provide all labor, tools, equipment and materials necessary to complete all earthwork of this project. Work includes:
1. Excavating, filing, backfilling, removing buried structures and utilities that conflict with new work or that are specified on the drawings to be removed, shoring and bracing and dewatering.
 2. Providing common borrow, aggregates, topsoil, and stone and moving and placing suitable material salvaged from on site to achieve the specified material depths and finish grades as shown on the drawings.
 3. Grading the site as shown on the drawings and as specified herein.
 4. Excavating, bedding and backfilling trenches for utilities.

1.02 PROTECTION:

- A. Paved Surfaces: Do not operate equipment on paved surfaces not specified to be replaced or reconstructed which will damage these surfaces.
- B. Maintain excavations with approved barricades, lights, and signs to protect life and property until excavation is filled and graded to a condition acceptable to the Engineer.
- C. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

1.03 QUALITY ASSURANCE:

- A. Testing and Inspection: Contractor will pay for all aggregate gradation testing, for moisture maximum density tests and field compaction tests.

1.04 SUBMITTALS:

- A. Test Reports: Submit reports on material gradations and Proctor density on select fill, sand, granular fill, aggregate subbase and aggregate base.

- B. Manufacturers' literature and test results for erosion control blanket and geotextiles demonstrating compliance with mechanical and hydraulic properties and test methods specified.

1.05 JOB CONDITIONS:

- A. Site Information: Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn therefrom by Contractor. Data is made available for convenience of Contractor. Additional test borings and other exploratory operations may be made by Contractor at no cost to Owner.
- B. Existing Utilities: Locate existing utilities in areas of work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.

Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult Owner immediately for directions. Cooperate with Owner in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of Owner.

Do not interrupt existing utilities serving facilities occupied and used by Owner or others, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.

Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with Owner for shutoff of services if lines are active.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General:

1. Suitable Materials: Materials shown on the Drawings, or specified herein.
2. Unsuitable Materials: Materials containing clay, vegetation, organic matter, debris, pavement, stones, or boulders over 6 inches in greatest dimension, and frozen material. Any material which, in the opinion of the Engineer, will not provide a suitable foundation or subgrade.
3. On-Site Materials: Any suitable material from on-site excavation.
4. Material for embankments and general fills may contain pieces of excavated ledge having a greatest dimension of up to 12 inches if approved by the Engineer.

5. Inspection: The Engineer may inspect off-site sources of materials and order tests of these materials to verify compliance with these specifications.

B. Sand: Sieve analysis by weight:

<u>Sieve Size</u>	<u>% Passing</u>
3/8"	100
No. 4	95 - 100
No. 16	50 - 85
No. 100	2 - 10

C. 3/4" Crushed Stone: MDOT 703.02- Crushed stone on gravel having hard, durable pieces, free of organic matter and other unsuitable material. Crushed stone shall conform to the gradation requirements of ASTM C33, Class 67 stone that is a nominal 3/4" size material.

D. Gravel Borrow: MDOT 703.20- Gravel borrow shall consist of a uniformly graded granular material having no rocks with a maximum dimension of over 6 inches. The gradation of that portion passing a 75 mm (3 inch) sieve shall meet the gradation requirement of the following table:

<u>Sieve Designation</u>	<u>Percentage by Weight Passing Square Mesh Sieves</u>
No. 1/4	0-70
No. 200	0-10.0

E. Select Fill/Structural Fill: Screened or crushed gravel of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances meeting the following gradation requirements:

<u>Sieve Designation</u>	<u>Percentage by Weight Passing Square Mesh Sieves</u>
4"	100
3"	90-100
1/4"	25-90
No. 40	0-30
No. 200	0-5

F. Aggregate Base: MDOT Standard Specification 703.06 (a) Type A, revision of April 1995.

Aggregate for base shall be a screened or crushed gravel of hard durable particles, free of vegetable matter, lumps or balls of clay, or other deleterious substances. The gradation of that portion passing the 3-inch sieve shall meet the requirements of the following table:

<u>Sieve Designation</u>	<u>Percentage by Weight Passing Square Mesh Sieves</u>
1/2"	45-70
1/4"	30-55
No. 40	0-20
No. 200	0-5.0

Aggregate for base shall not contain any particle which will not pass the 2-inch square sieve.

- G. Aggregate Sub-Base: Material shall be a screened or crushed gravel of hard, durable particles, free of vegetable matter, lumps of balls of clay, or other deleterious substances. Aggregate for subbase shall not contain particles of rock which will not pass the 6 inch square mesh sieve.

Maine D.O.T 703.06 (b) Type D revision of April 1995. Sieve analysis by weight:

<u>Sieve Size</u>	<u>Passing</u>
1/4"	25-70
No. 40	0-30
No. 200	0-7.0

- H. Refill Material: Crushed stone for refilling excavation below grade or rock excavation unless otherwise directed by the Engineer.

2.02 EROSION CONTROL BLANKET: Equal to SC 150 Erosion Control Blanket by North American Green, Evansville, IN.

2.03 GEOTEXTILES: MDOT Standard Specification 722.03 class A Erosion Control Geotextile.

PART 3 - EXECUTION

3.01 EXCAVATION:

- A. General: Remove all materials encountered to the limits shown on the drawings, or designated in the specifications.

- B. Classifications: Excavation will be classified as earth excavation or rock excavation when unanticipated rock excavation is encountered in work.

Do not perform rock excavation until material to be excavated has been cross-sectioned and classified by Engineer. Rock excavation will be paid on basis of contract conditions relative to changes in work.

- C. Earth Excavation: Removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, and other materials encountered that are not classified as rock excavation or unauthorized excavation.

- D. Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10', and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.

In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

- E. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations, and grades as shown.

- F. Excavation in Paved Areas: Cut pavement prior to excavation to provide a clean, uniform edge. Minimize disturbance of remaining pavement. Cut and remove the minimum amount of pavement required to do the work.

Use shoring and bracing where sides of excavation will not stand without undermining pavement.

- G. Excavation for Trenches: Dig trenches to the uniform width required for particular item to be installed, sufficiently wide to provide ample working room.

Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations. Beyond building perimeter, keep bottoms of trenches sufficiently below finish grade to avoid freeze-ups.

Where rock is encountered, carry excavation 6" below required elevation and backfill with a 6" layer of bedding material prior to installation of pipe.

Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.

- H. Unauthorized Excavation: Removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, including refilling, is at Contractor's expense.
- I. Refilling Unauthorized Excavation:
1. Trenches: Use crushed stone or gravel.
 2. Earth Excavation for Structures: Use gravel.
 3. Elsewhere: Backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.
- J. Excavation Below Grade: When excavation has reached required subgrade elevations, notify Engineer who will make an inspection of conditions. If unsuitable materials exist at required subgrade elevations, carry excavations deeper and replace excavated material as directed by Engineer.
- K. Material Storage: Stockpile suitable excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.

Locate and retain soil materials away from edge of excavations.

3.02 STABILITY OF EXCAVATIONS:

- A. General: Slope sides of excavations to comply with OSHA regulations and local codes. Shore and brace where sloping is not possible.

Maintain sides and slopes of excavations in safe condition until completion of backfilling.

- B. Shoring and Bracing: Provide materials for shoring and bracing to comply with OSHA requirements and local codes.

Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

3.03 DEWATERING:

- A. General: Perform all work in the dry. Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.

Do not allow water to accumulate in excavations. Provide and maintain pumps and dewatering system components necessary to convey water away from excavations.

Convey water removed from excavations and rain water to collecting or run-off areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.

- B. Payment: Costs of dewatering are incidental to other work. No payment will be made for dewatering, including dewatering required for excavation below normal grade.

3.04 BACKFILL AND FILL:

- A. General: Place acceptable soil material in layers to required elevations as shown on the Drawings and as listed below.

Fill, backfill, and compact to produce minimum subsequent settlement of the material and provide adequate support for the surface treatment or structure to be placed on the material. Place material in approximately horizontal layers beginning at lowest area to be filled. Do not impair natural drainage.

- B. Backfill excavations as promptly as work permits, but not until completion of the following:

- Acceptance of construction below finish grade, including dampening, waterproofing, and perimeter insulation.
- Inspection, testing, approval, and recording locations of underground utilities and pipe.
- Removal of concrete formwork.
- Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
- Removal of trash and debris.
- Permanent or temporary horizontal bracing is in place on horizontally supported walls.

Use care in backfilling to avoid damage or displacement of underground structures and pipe.

- C. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of materials.

- D. Placement: Place backfill and fill materials in layers not more than 12" in loose depth for material compacted by heavy compaction equipment and not more than 6" in loose depth for material compacted by hand operated tampers. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

Place backfill and fill materials evenly adjacent to structures to required elevations. Take care to prevent wedging action of backfill against structures by carrying material uniformly around structure to approximately same elevation in each lift. Backfill cast-in-place concrete structures when the concrete has developed adequate strength. Do not allow heavy machinery within 5 feet of structure during backfilling and compacting.

- E. Pipe Bedding: Either shape the bedding surface to conform the shape of the lower section of pipe after compaction using care not to disturb bedding left in place or carefully tamp bedding beneath the haunches of the pipe using care not to lift or distort the pipe. When tamping bedding beneath the haunches do not allow rocks larger than 1 1/2" to bear against the pipe. Maximum loose-lift thickness of bedding shall be 6 inches.

- F. Replacement of Unsuitable Materials:

1. Below Normal Grade: See Paragraph 3.01
2. Above Normal Grade: Replace unsuitable material with suitable on-site material or common borrow.

3.05 PLACEMENT OF GEOTEXTILE:

- A. General: Install in accordance with manufacturer's specifications.

3.06 COMPACTION:

- A. Methods: Use methods which produce the required degree of compaction throughout the entire depth of material placed without damage to new or existing facilities and which are approved by the Engineer. Adjust moisture content of soil as required. Remove and replace material which is too wet to compact to required density.

- B. Degree of Compaction: Compact to the following minimum densities:

<u>Fill & Backfill Location</u>	<u>Density</u>
Under Structure Foundations	95% of max.
Top 2 Feet Under Pavement	95%
Below Top 2 Feet Under Pavement	93%
Trenches Through Unpaved Areas	90%

Embankments	90%
Pipe Bedding	90%
Within 10 Feet of Structure Foundation	92% to 95%

Maximum Density: ASTM D1557, modified

Field Density Tests: ASTM D1556 (sand cone), ASTM D2167 (rubber balloon), or ASTM D2922 (nuclear)

- C. Testing: Determine actual in-place densities using field tests as directed by the Engineer. Tests will be made by an independent laboratory. Costs for tests will be incidental to the cost of construction.

Perform additional work to obtain proper compaction if in-place densities do not meet the specified densities. Re-testing may be required by the Engineer.

- D. Minimum Number of Tests:

1. Paved Areas: In each compacted fill layer, make one field density test for every 2,000 square feet of paved area, but in no case less than 3 tests.

3.07 GRADING:

- A. Grading: Uniformly grade areas within limits of grading, including adjacent transition areas. Smooth finished surface within specified tolerances and compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

- B. Finish surfaces free from irregular surface changes as follows:

1. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 1/2" above or below required subgrade elevation.

3.08 PAVEMENT SUBBASE COURSE:

- A. General: Subbase course consists of placing subbase material, in layers of specified thickness, over subgrade surface to support a pavement base course.

- B. Grade Control: During construction, maintain lines and grades, including crown and cross-slope of subbase course.

- C. Placing: Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.

When a compacted subbase course is shown to be 6" thick or less, place material in a single layer. When shown to be more than 6" thick, place material in equal layers, except no single layer more than 6" or less than 3" in thickness when compacted.

3.09 MAINTENANCE:

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

3.10 DISPOSAL OF EXCESS AND WASTE MATERIALS:

- A. Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of it off Owner's property.

* END OF SECTION 02200 *